

WHAT IS CLAIMED IS:

Claim 1. A soft magnetic particle comprising:

an elongated first portion formed of a soft magnetic material; and

a second portion disposed on said first portion in an amount from about 0.05 weight percent to about 1 weight percent, said second portion being formed of an electrically insulating material.

Claim 2. The soft magnetic particle as in claim 1, wherein said amount is from about 0.1 weight percent to about 0.15 weight percent.

Claim 3. The soft magnetic particle as in claim 2, wherein said electrically insulating material comprises silicone.

Claim 4. The soft magnetic particle as in claim 1, wherein said soft magnetic material comprises Fe or an Fe alloy.

Claim 5. The soft magnetic particle as in claim 4, wherein said Fe alloy is selected from the group consisting of Co, Ni, Si, Al, B, P, C, Cr, Mn, and any combinations thereof.

Claim 6. The soft magnetic particle as in claim 1, wherein said first portion has an aspect ratio of between about 20 to about 500.

Claim 7. The soft magnetic particle as in claim 6, wherein said first portion has a cross-sectional shape selected from the group consisting of a rectangular shape, a polygonal shape, an oval shape, circular shape, and any combinations thereof.

Claim 8. A method of applying a coating to a plurality of elongated soft magnetic particles, the method comprising:

separating the plurality of elongated soft magnetic particles from one another with a first gas flow so that the coating can be applied to the plurality of elongated soft magnetic particles when separated;

fluidizing the plurality of elongated soft magnetic particles with a second gas flow after the plurality of elongated soft magnetic particles form a bed so that a third gas flow can urge the plurality of elongated soft magnetic particles in said bed back into said first gas flow; and

applying a fourth gas flow to said bed.

Claim 9. The method as in claim 8, wherein said fourth gas flow is sufficient to allow coating of particles having an aspect ratio of between about 20 to about 500.

Claim 10. The method as in claim 9, wherein said fourth gas flow is a forced gas flow, a resultant gas flow, or any combination thereof.

Claim 11. The method as in claim 10, wherein said fourth gas flow has a direction substantially orthogonal to said first gas flow.

Claim 12. The method as in claim 10, wherein said fourth gas flow aids said second gas flow in fluidizing the plurality of elongated soft magnetic particles.

Claim 13. The method as in claim 10, wherein said fourth gas flow aids said third gas flow in urging the plurality of elongated soft magnetic particles in said bed back into said first gas flow.

Claim 14. The method as in claim 8, further comprising repeating until the coating is applied to the plurality of elongated soft magnetic particles has a weight in a range from about 0.05 weight percent to about 1 weight percent.

Claim 15. The method as in claim 8, further comprising repeating until the coating is applied to the plurality of elongated soft magnetic particles has a weight in a range from about 0.1 weight percent to about 0.15 weight percent.

Claim 16. The method as in claim 8, wherein the plurality of elongated soft magnetic particles have a size distribution in a range of about 1:10.

Claim 17. The method as in claim 8, wherein the plurality of elongated soft magnetic particles have a size distribution in a range of about 1:4.

Claim 18. A composite magnetic article comprising a plurality of soft magnetic particles compacted to a selected density, each of said soft magnetic particles having an elongated first portion coated with an insulating second portion such that the composite magnetic article has a core loss of less than about 6 Watts per pound at a magnetic flux density of about 1 Tesla and a frequency of about 60 Hertz.

Claim 19. The composite magnetic article as in claim 18, wherein said core loss is less than about 2.5 Watts per pound at a magnetic flux density of about 1 Tesla and a frequency of about 60 Hertz.

Claim 20. The composite magnetic article as in claim 19, wherein said elongated first portion is coated with said insulating second portion such that the composite magnetic article has a magnetic permeability of greater than about 1000 at a magnetic flux density of about 1 Tesla and a frequency of about 60 Hertz.

Claim 21. The composite magnetic article as in claim 18, wherein said elongated first portion has an aspect ratio of between about 20 to about 500.

Claim 22. The composite magnetic article as in claim 18, wherein said insulating second portion has a weight in a range from about 0.05 weight percent to about 1 weight percent.

Claim 23. The composite magnetic article as in claim 18, wherein said insulating second portion has a weight in a range from about 0.1 weight percent to about 0.15 weight percent.

Claim 24. The composite magnetic article as in claim 18, wherein the composite magnetic article is an article selected from the group consisting of a stator, a rotor, a solenoid, a transformer core, an inductor, an actuator, an MRI pole face, an MRI shim, a sensors, and an electronic circuit.